SNS 102000000-SR0001-R00

Spallation Neutron Source

Systems Requirements Document for Equipment, Device and Signal Naming

May 2000

Draft May 24, 2000

SNS 102000000-SR0001-R00

SPALLATION NEUTRON SOURCE
SYSTEMS REQUIREMENTS DOCUMENT
FOR EQUIPMENT, DEVICE AND SIGNAL NAMING

Date Published: January 2000

Prepared for the
U.S. Department of Energy
Office of Science

UT-BATTELLE, LLC
managing the
Spallation Neutron Source Activities at the
Argonne National Laboratory
Brookhaven National Laboratory Lawrence Berkeley National Laboratory
Los Alamos National Laboratory Oak Ridge National Laboratory
under contract DE-AC05-96OR22464
for the
U.S. DEPARTMENT OF ENERGY

SPALLATION NEUTRON SOURCE
SYSTEMS REQUIREMENTS DOCUMENT
FOR EQUIPMENT, DEVICE AND SIGNAL NAMING

January 2000

_____	_____
R. E. Etheridge	**Date**
Conventional Facilities Division Director	
_____	_____
R. Kustom	**Date**
Accelerator Division Director	
_____	_____
T. E. Mason	**Date**
Experimental Facilities Division Director	
_____	_____
L. E. Temple	**Date**
SNS Project Director	

CONTENTS

LIST OF TABLES

1. PURPOSE

This requirements document defines the equipment, device, and signal naming and numbering to be used for all SNS systems.

2. SCOPE

These requirements apply to all devices (beam instrumentation, sensors, actuators, etc.), equipment (power supplies, magnets, RF cavities, targets, moderators, instruments, etc.) and signals in technical systems and conventional facilities. These requirements do not apply to cable numbering, pipe numbering, or location designations throughout the facility.

The designations listed are to be used on drawings, schematics, computer software, project databases, equipment name tags, test procedures, and other sources of information. The complete name is intended primarily for use on operator screens to communicate device and signal information that is most applicable to operators. For best communication, names on drawings, name tags, and other information sources should be consistent with the complete name used by operators. However, as shown below, names used on drawings and equipment tags need not include the complete name.

3. REQUIREMENTS

Format and syntax shall be as shown on Figure 1. Only the device and/or signal name is required on drawings, name tags, etc. where the drawing or device name clearly indicates the system and subsystem including the equipment. However, where a drawing for one system shows equipment in other systems, the full name must be shown.

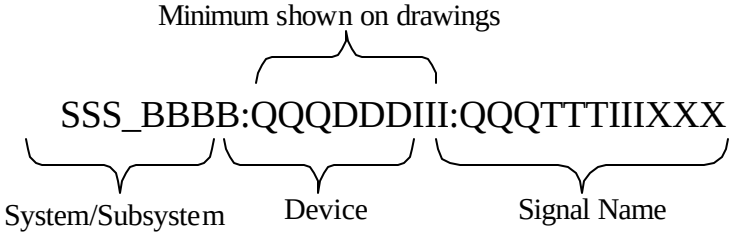

Figure 1: Format and Syntax

Requirements for specific naming elements are listed in Table 1 below

Table 1. Numbering requirements

Naming part	Description	Requirements	Controlled by
Format and Syntax	Entire name	Figure 1 and Syntax rules in Table 2	Project Director
SSS	System	Names in Table 3	Division Director
		Subsystem names in Table 4 may be used if they clearly indicate the system	
BBBB	Subsystem	Names in Table 4.	Senior Team Leaders
		May be omitted if subsystem is obvious from system name or device name.	
QQQ	Device Qualifier	Use is optional. Qualifiers are assigned by WBS Level 3 task leaders (Could be an associated piece of equipment)	Level 3 Task Leaders
		Example: SplTnk for spill tank or HX1_TE for temperature element on a heat exchanger.	
		Qualifiers are used to show facility location for cabinets (See SRD for Cabling, SNS 109010000)	
DDDD	Device Type	Names in Table 5 or IEEE 803 Recommended Practice for Unique Identification in Power Plants and Related Facilities for conventional facilities or assigned by STL.	Table 5 by Senior Team Leader for Global Controls
IIII	Device Instance	Number per Table 7. Numbers are assigned by Level 3 task leaders	Senior Team Leaders
QQQ	Signal Qualifier	Use is optional. Qualifiers assigned by WBS Level 3 task leaders	Level 3 Task Leaders
TTT	Signal Type	Table 6 or assigned by Level 3 Task Leader	Level 3 Task Leaders
XXX	Suffix	Use is optional. Qualifiers assigned by WBS Level 3 task leaders ISA Standard S5.1 Instrumentation Symbols and Identification where applicable	Level 3 Task Leaders

Table 2. Syntax rules

Name part	Syntax rules
Syntax rules for the general naming format	1. The delimiter "_" is used to separate system and subsystem names. The delimiter ":" is used to separate equipment or device name from its system/subsystem prefix. 2. Subsystem names are optional and may be omitted if subsystem is obvious from preceding system name or from succeeding equipment or device name. 3. The first character of each name (System Name, Subsystem Name, etc.) shall be alphabetic. 4. Alphabetic characters "I" and "O" should not be used where they introduce the potential of confusion with the numbers "1" and "0". 5. Letter case shall not be used to distinguish between names. That is, there shall never be two names for which the only difference is letter case. 6. Letter case shall be used to improve readability. The first letter of a word or abbreviation shall be capitalized; succeeding letters shall be lower case. Acronyms shall be all capital letters. 7. The only non-alphanumeric characters used shall be ":" and "_". The colon (":") shall be used only as a delimiter between name parts. The underscore ("_") shall not be used as part of the system name and shall be used only as a delimiter prefix in the subsystem name. However in the equipment name "_" can be used as desired to improve readability (but not as a first character).
Syntax rules for Signal Names (See Figure 1)	1. The first character shall be alphabetic. 2. Alphabetic characters "I" and "O" should not be used where they introduce the potential of confusion with the numbers "1" and "0". 3. Letter case shall not be used to distinguish between names. That is, there shall never be two names for which the only difference is letter case. 4. Letter case shall be used to improve readability. The first letter of a word or abbreviation shall be capitalized; succeeding letters shall be lower case. Acronyms shall be all capital letters. 5. The only non-alphanumeric character used shall be "_", which can be used as desired to improve readability (but not as a first character).

Table 3. System codes

WBS	System code	System code description
1.3	FE	Front End Systems
1.3	LEBT	LEBT
1.3	MEBT	MEBT
1.3	RFQ	RF quadrapole
1.3	Src	Ion source
1.4	Lin	Linac
1.4	DTL	Drift tube linac
1.4	CCL	Coupled cavity linac
1.4	SCL	Superconducting linac
1.4	SCMB	Medium Beta linac
1.4	SCHB	High Beta linac
1.4	CHL	Central Helium Liquefier
1.5	HEBT	HEBT
1.5	Ring	Ring
1.5	RTBT	RTBT
1.6	Tgt	Target systems
1.6	Edmp	Ring extraction dump
1.6	Idmp	Ring injection dump
1.6	LDmp	Linac dump
1.7	ISF	Instrument Support Facilities
1.7	Instr	Instruments
1.8	CF	Conventional Facilities
	Util	Utility systems
1.8	Elec	Power and communication systems
1.8	Mech	HVAC and utilities systems
1.8	Wste	Waste systems
1.9	ICS	Integrated Control System
1.9	PPS	Personnel Protection System

Table 4. Subsystem codes

Subsystem code	Subsystem description
	Subsystems used in multiple systems
Accl	Accelerator
Chop	Chopper
Cm	Communication room
Cr	Control room
Cryo	Crogenics
Ctl	Control system
Diag	Diagnostics
DIWS	Deionized Water System
Gen	General
Lcr	Local control room
Mag	Magnets
MCR	Main control room
PS	Power Supply
RF	RF systems
Tim	Timing
Vac	Vacuum

Subsystem code	Subsystem description
	Front End Specific Subsystems
FE	Front End
Bnch	(MEBT) Buncher
	Linac Specific Subsystems
CCL	Coupled cavity linac
DTL	Drift tube linac
HB	High Beta
Lin	Linac
MB	Medium Beta linac
SCL	Superconducting linac
	Ring Specific Subsystems
Extr	Extraction
HEBT	HEBT
Inj	Injection
Ring	Ring
RTBT	RTBT
	Target Systems Specific Subsystems
Bay	High-bay maintenance subsystems (for sys TRH)
BL	Beamline maintenance subsystem (for sys TRH)
BL1	Neutron beam line #1 (for system TSh)
Cell	Maintenance shell subsystems (for sys TRH)
D2O	Heavy water cooling subsys. (for system TUtl)
EDmp	Ring extract dump maint subsys (for sys TRH)
He	Helium gas subsystem (for sys TUtl)
Hg	Target mercury loop
IDmp	Ring injection dump maint subsys (for sys TRH)
LDmp	Linac beam dump maint subsys (for sys TRH)
LWS1	Target utilities Light Water Loop 1 for cooling after to the main Hg heat exchanger
LWS2	Target utilities Light Water Loop 2 for cooling after to the main Hg heat exchanger
LWS3	Target utilities Light Water Loop 3 for cooling after to the main Hg heat exchanger
NFSS	Nuclear facility safety significant system
RHcrProc	Remote handling control room (for sys TRH)Target process systems
Roof	Target roof structure (for system TSh)
TModHg	Target moderator systemsTarget mercury loop
TPS	Target Protection System
Tran	Target transport systems
TRefTran	Target reflector assembliesTarget transport systems
TRHAmb1	Target remote handlingAmbient-temp. moderator #1 (for system TMod)
TShAmb2	Target station shieldingAmbient-temp. moderator #2 (for system TMod)
TUtlCry1	Target utility systemsCryogenic moderator #1 (for system TMod)
TVesCry2	Vessel assembliesCryogenic moderator #2 (for system TMod)
Vlt	Utility vault maintenance subsystem (for sys TRH)
VsVac	Vessel vacuum subsystem (for sys TUtl)
	Instrument Specific Subsystems
BmLn	Incident instrument beam line
DAS	Data Acquisition System
FltPth	Flight path

Subsystem code	Subsystem description
Guide	Instrument neutron guide tubes
Inel1	Spectrometer, microvolt
Inel2	Spectrometer, 100 microvolt
Inel4	Spectrometer, wide angle chopper
Inel5	Spectrometer, large solid angle single crystal
Pow3	Powder diffractometer, long wavelength
Pow6	Powder diffractometer (strain; high resolution)
Pow7	Powder diffractometer (for glasses and liquids)
Ref1	Reflectometer, vertical refl. plane
Samp	Sample chamber
SANS2	Small angle neut scattering, Gen/lower Q high res
SCD1	Diffractometer, general purpose single crystal
	Conventional Facilities Specific Subsystems
BHWS	Building Heating Water System
CA	Compressed air system
CWR	Chilled Water Return
CWS	Chilled Water Supply
CT	Cooling Tower
DCR	Deionized Water Return
DWS	Deionized Water Supply
Elec	Electrical power and communication systems
FCryo	Facility cryogenic systems
FGas	Facility gas distribution systems
FVac	Facility vacuum system
FWD	Fire Water
GND	Grounding system
GWTS	Gaseous waste treatment systems
HVAC	Heating, ventilation, and air conditioning systems
HWR	Heating Water Return
HWS	Heating Water Supply
LLLW	Liquid low-level waste treatment systems
NG	Natural gas systems
PW	Process Water System
PWTS	Process waste treatment sytems
SD	Storm Drain
SW	Sanitary Water System
SS	Sanitary Sewer
	Integrated Controls Systems
EPS	Equipment Protection System
ICS	Integrated Control System
PPS	Personnel Protection System

Table 5. Device type

Device code	Device code description
AHU	Air handling unit
Aprt	Aperture
Anod	Anode
BCM	Beam current monitor
BIG	Beam in gap monitor
Bldg	Building
BLM	Beam loss monitor
BPM	Beam position monitor
BPMH	Beam position monitor, horizontal
BPMV	Beam position monitor, vertical
Cab	Instrument and control cabinets
Cbl	Cable
Cath	Cathode
Cav	RF cavity
Cs	Cesium
CCG	Cold cathode vacuum gauge
Chll	Chiller
Colim	Collimator
Cllr	Collar
CVG	ConVectron Gauge
CP	CryoPump
Damp	Damper
DCBPM	DC beam position monitor
DCH	Dipole magnet, corrector, horizontal
DCV	Dipole magnet, corrector, vertical
DEC	Decapole magnet
DH	Dipole magnet, horizontal
Dr	Door
DV	Dipole magnet, vertical
EKick	Extraction kicker
Fan	Fan
FBCM	Fast Beam Current Monitor
FBLM	Fast Beam Loss Monitor
Fltr	Filter
FV	Fast valve
FS	Flow Switch
GV	Gate Valve
Grid	Grid (bias)
He	Helium
Hg	Mercury
Htr	Heater
H2	Hydrogen
H2O	Water
HX	Heat exchanger
IG	Ion gauge
IkickH	Horizontal Injection kicker
IKickV	Vertical Injection kicker
IP	Ion pump
IPA	Intermediate Power Amplifier
IX	Ion exchanger
Match	Matcher
Mix	Agitators, mixers
Mot	Motor

Table 5. Device type

Device code	Device code description
Mod	Modulator
MV	Manual valve
NEGP	Non-evaporable getter pump
N2	Nitrogen
Oct	Octupole magnet
OctH	Octupole magnet, horizontal
OctV	Octupole magnet, vertical
OPS	OverPressure Sensor
PA	Power amplifier
Drvrr	Driver
Pen	Penetration
Pipe	Pipe
Plt	Plate
Pmp	Pump
PrM	Beam profile monitor
PrMH	Beam profile monitor, horizontal
PrMV	Beam profile monitor, vertical
Q	Quadrupole magnet
QH	Quadrupole magnet, horizontal
QS	Quadrupole magnet, skew
QSH	Quadrupole magnet, skew, horizontal
QSV	Quadrupole magnet, skew, vertical
QV	Quadrupole magnet, vertical
Reg	Regulator
RF	Radio Frequency (amplifier, etc)
RGA	Residual gas analyzer
RP	Roughing pump
RV	Roughing valve
Scrp	Scraper
SGV	Sector gate valve
Shld	Shield
Scrn	Screen
SX	Sextupole magnet
SXH	Sextupole magnet, horizontal
SXS	Sextupole magnet, skew
SXSCH	Sextupole magnet, skew, corrector, horizontal
SXSCV	Sextupole magnet, skew, corrector, vertical
SXSH	Sextupole magnet, skew, horizontal
SXSV	Sextupole magnet, skew, vertical
SXV	Sextupole magnet, vertical
TCG	Thermocouple (vacuum) gage
Tnk	Tanks, receivers
TMP	Turbomolecular pump
Tnr	RF Tuner
TSP	Titanium sublimation pump
Twr	Tower
Vlt	Vault
Vlv	Valve
VS	Vacuum sector
Vsl	Vessel
VV	Vent Valve
WCM	Wall current monitor
WvG	Waveguide

Table 6. Signal type

Signal code	Signal code description
Acc	Acceleration
B	Field
Clk	Clock
Cmd	Command (e.g. start/stop)
Ctl	Control (e.g. on/off)
Dr	Door (e.g. interlock)
DP	Differential pressure
Flt	Fault
Flw	Flow (analog or digital)
Fn	Function
G	Gain
Hor	Horizontal (e.g. BPM horizontal position)
Ver	Vertical (e.g. BPM vertical position)
Hall	Hall probe
Ilk	Interlock
I	Current
Cur	Beam current
Lim	Limit
Lcl	Local (/Remote)
Lk	Leak
Lvl	Level
OI	Over-current
OT	Over-temperature
OV	Over-voltage
P	Pressure
pH	pH
Pos	Position
UPos	Upstream position (e.g. collimator upstream pos)
Pwr	Power
Rad	Radiation
Spd	Speed
Sts	Status
Tim	Time
T	Temperature
V	Voltage
DPos	Downstream position (e.g. collimator downstrm pos)
Pr	Profile (vector or array) (e.g. horiz profile mon)

Table 7: Instance Numbering

Subproject	Instance Numbering
Front End	Some devices span all the Front End subsystems and therefore will appear as generic "Front End" devices. Examples from Front End: FE_Chll_2: Front end; Chiller 2 FE_Ctl:ioc_1 Front End; IOC 1 Most devices are associated with particular subsystems, and follow the general guidelines. Examples from Source: Src:Cs_Htr Source; Cesium Heater Examples from LEBT: LEBT:Focus_1 LEBT; Focus 1 Examples from MEBT: MEBT:QH_1 MEBT; Quadrupole 1, Horizontal
Linac	The linac is divided into ever smaller components as follows: modules, segments, cavities, cells. Linac devices should be instantiated using the number of the *preceding* segment. For example: CCL:QH122 Horizontally focusing quadrupole after segment 122 CCL:BPM122 Beam position monitor located after segment 122 CCL:QH123 Horizontally focusing quadrupole located after 123 CCL:PS_QH123 Power supply powering QH123 CCL:QV124 Vertically focusing quadrupole after segment 124 CCL:DCV124 Vertical Steering Magnet (Dipole Corrector - Vertical) after segment 124 CCL:Tor124 Toroid located after segment 124 CCL:PrMH125 Horizontal Profile Monitor after segment 125 CCL_Vac:IG156 Ion Gauge located after segment 156

Ring	Ring magnets and power supplies instances will be assigned as follows. The ring lattice consists of four superperiods, each containing a 90 degree arc and a long straight section. The four superperiods are labeled A, B, D, and run sequentially along the beam direction from the beginning of one arc to the beginning of the next. The order of magnets in each superperiod X is DHX1, QVX1, …,QHX10, QVX11, QHX12 where D and Q denote dipoles and quadrupoles, and H and V refer to the horizontal and vertical planes. The long straight sections in superperiod X run from QHX8 through QHX12. Devices in the beam transport lines will be labeled similarly except that there will be no superperiod. Devices will be numbered sequentially from a starting point. Examples of Ring power supply devices follow: Ring_PS:DVA3 Ring, Power Supply, Dipole Vertical, superperiod A, #3 Ring_PS:QHB1 Ring, Power Supply, Quadrupole, Horiz., superperiod B, #1 Ring_PS:DCHA4 Ring, Power Supply, Dipole Corrector Horiz, #4 Instance designations for ring equipment not directly related to a specific ring or transport line location will be simply assigned a sequential number. Examples of ring vacuum devices: Ring_Vac:FV1 HEBT_Vac:IP3 RTBT_Vac:SGV2 Ring_Vac:TSP2 Examples of ring diagnostic devices: Ring_Diag:BCM1 Ring, Diag, BCM, #1 Ring_Diag:BLM5 Ring, Diag, BLM, #5 Ring_Diag:BPMH1 Ring, Diag, BPMH, #1 Examples of ring RF devices: Ring_RF:Cav Ring_RF:PA Examples of other ring devices: HEBT:Colim1 HEBT, Collimator#1 HEBT:Colim2 HEBT, Collimator#2 Downstream position

<table>
<tr><td>Target Systems</td><td>The device and instance naming convention should be based on the convention in IEEE 803.1. Instance numbers should be as follows:

<table>
<tr><th>WBS</th><th>NAME</th><th>NUMBERS</th></tr>
<tr><td>WBS 1.6.1</td><td>Mercury loop</td><td>5000 – 5499</td></tr>
<tr><td>WBS 1.6.2</td><td>Moderator</td><td>6000 – 6999</td></tr>
<tr><td>WBS 1.6.3</td><td>Reflector</td><td>7000 – 7499</td></tr>
<tr><td>WBS 1.6.4</td><td>Vessel</td><td>7500 – 7999</td></tr>
<tr><td>WBS 1.6.5</td><td>Shielding</td><td>8000 – 8499</td></tr>
<tr><td>WBS 1.6.6</td><td>LWS1</td><td>1000 – 1499</td></tr>
<tr><td>WBS 1.6.6</td><td>LWS2</td><td>1500 – 1999</td></tr>
<tr><td>WBS 1.6.6</td><td>LWS3</td><td>2000 – 2499</td></tr>
<tr><td>WBS 1.6.6</td><td>D2O</td><td>2500 – 2999</td></tr>
<tr><td>WBS 1.6.6</td><td>Helium</td><td>3000 – 3499</td></tr>
<tr><td>WBS 1.6.6</td><td>Vacuum</td><td>3500 – 3999</td></tr>
<tr><td>WBS 1.6.7</td><td>Remote H.</td><td>4000 – 4999</td></tr>
<tr><td>WBS 1.6.8</td><td>TPS</td><td>5500 – 5999</td></tr>
<tr><td>WBS 1.6.9</td><td>Linac dump</td><td>9000 – 9299</td></tr>
<tr><td>WBS 1.6.9</td><td>Beam inj. Dmp</td><td>9300 – 9599</td></tr>
<tr><td>WBS 1.6.9</td><td>Beam ext. dmp</td><td>9600 – 9999</td></tr>
<tr><td></td><td>Miscellaneous</td><td>0000 – 0999</td></tr>
<tr><td>WBS 1.9.6</td><td>Control</td><td>8500 – 8999</td></tr>
</table>

The offgas and waste handling equipment should be included with one of these loops. Use the miscellaneous category for equipment not included with other systems.

Based on this a pressure gauge in the utility loop LWS1 would be the following:
Tgt_LWS1:Device1Instance, for example a tank in loop LWS1 would be
Tgt_LWS1:Tk1001
A pressure instrument connected to the tank could be named
Tgt_LWS1:PE1002</td></tr>
<tr><td>Experiment Systems</td><td>Systems in support facilities should use the instance numbering technique used for conventional facilities process instrumentation. For equipment and devices associated with neutron beam lines or instruments, the first digit in the instance number should indicate the beam line or instrument number.</td></tr>
<tr><td>Conventional Facilities</td><td>Equipment and associated “Tag Names” should be named according to IEEE 803, IEEE Recommended Practice for Unique Identification in Power Plants and Related Facilities, which references the Instrument Society of America (ISA) Standard S5.1 (“Instrumentation Symbols and Identification”). Tag numbers should be assigned as follows:

Power & Communication systems: 0000 - 1999
HVAC systems: 2000 - 3999
Water systems: 4000 - 5999
Gas systems: 6000 - 7999
Waste Systems: 8000 - 9999</td></tr>
</table>